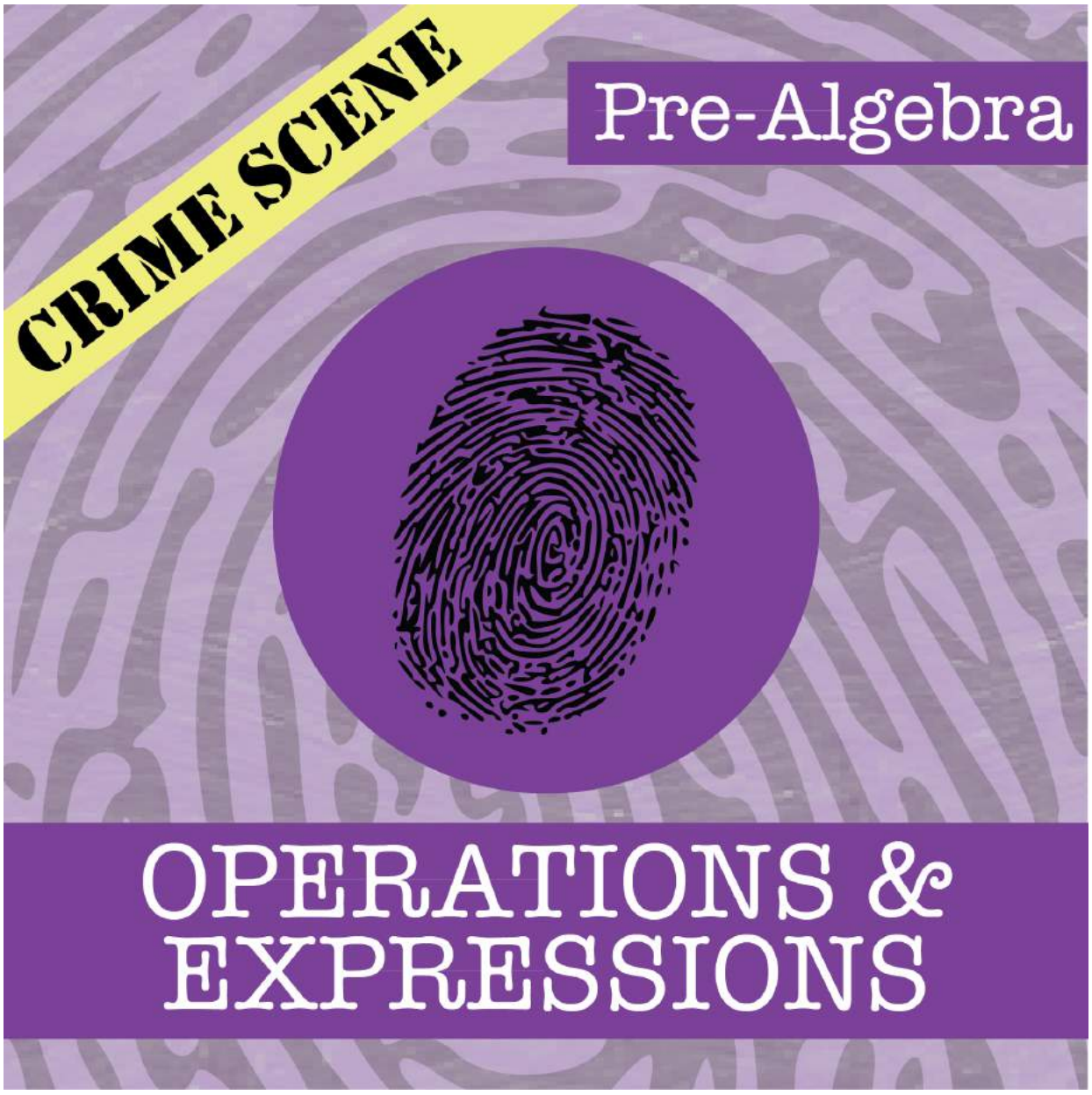


CSI PRE-ALGEBRA

Operations & Expressions

IDEAL UNIT:	Operations, Variables & Expressions	**TIME RANGE:**	45-60 Minutes	**SUPPLIES:**	Pencil & Paper

TOPICS OF FOCUS:

- Order of Operations
- Integer Operations
- Verbal Expressions
- Evaluating Expressions
- Combining Like Terms

COMMON CORE ALIGNMENT:

This particular unit was mapped to the curriculum of most pre-algebra textbooks. CSI activities are ideal as a small group unit review or an enrichment activity.

6.NS.5	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values; use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
6.NS.6a	Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., −(−3) = 3, and that 0 is its own opposite.
6.EE.2	Write, read, and evaluate expressions in which letters stand for numbers.
6.EE.2a	Write expressions that record operations with numbers and with letters standing for numbers.
6.EE.2b	Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity.
6.EE.2c	Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems.
6.EE.2d	Perform arithmetic operations, including those involving whole number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).
7.NS.1d	Apply properties of operations as strategies to add and subtract rational numbers.
7.NS.3	Solve real-world and mathematical problems involving the four operations with rational numbers.
7.EE.1	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

CSI

General Procedures

*A.) As an optional hook, you can provide or read students the letter from Chief Harris. These are relatively the same for each CSI activity and introduce the criminal, world region the crimes take place and the math topic.

B.) Provide groups (ideally 2-3), the possible suspects, 6 crime scene puzzles and worksheet. You may choose to laminate the criminals or crime scenes for easier reuse. They also work well printed as a packet.

C.) Students will work to solve the crime. Generally, it takes between 45-60 minutes to complete. You can drop hints or provide assistance to help groups that are behind the pace. There are some problems that push advanced critical thinking in applications and others that focus on repeated skill practice. Previewing which crime scenes might be the most challenging so you can be prepared to help small groups or the whole class is a good idea.

Answers in this document are provided, but not with much detail because there have been instances of students or their parents purchasing the documents when teachers have opted to use it as a summative assessment.

D.) At the end of each scene, students will receive a clue that will substitute into the "Cryptic Text Message". This provides an element of self-checking because if the Cryptic Text does not lead to a criminal, they know they need to recheck their work. In the end, students will determine which suspect should be arrested. *The gender, race and ethnicity of the guilty "suspect" is intentionally varied across the entire CSI series.*

*E.) There is an emphasis on "evidence" since this is an investigation. This means detailed work and the ability to argue their logic. You may like for students to create a portfolio of evidence proving that they have arrested the right person and will demonstrate their understanding of their mathematical content present in the problem.

*F.) Some teachers enjoy having their students present and defend their evidence to the class in a brief oral presentation.

*Optional Extensions

THE EVIDENCE

INVESTIGATOR:_____

1.

CLUE

2.

CLUE

3.

CLUE

4.

CLUE

5.

CLUE

6.

CLUE

CRYPTIC TEXT MESSAGE

SUSPECT

CSI: Operations & Expressions

Detectives,

As you know we are after a group of international evil geniuses, the Mathemagicians. Our evidence indicates they plan to build a world conquering device – to conquer the world. It seems one of the anonymous henchmen, Pemdas Orelse, has committed a string of robberies all over South America. We fear this is another step in the Mathemagician's attempt to build a world conquering device.

Fortunately, Pemdas has left behind a trail of notes and a cryptic text message that we have been told will calculate to their favorite number. Thus far there are six suspects that police have questioned. It is hoped that someone with a relatively strong number sense can crack some codes that have puzzled the detectives on the case so far.

Your job is to bring Pemdas to justice and save the planet. You need to be prepared to state your case and demonstrate your understanding of the following skills that Pemdas is known to use in his notes.

- Order of Operations
- Integer Operations
- Verbal Expressions
- Evaluating Expressions with Substitution
- Combining Like Terms

In your investigation, be sure to show all of your work. We need to have clear evidence that supports your calculations and conclusions. This is not a time to be sloppy. The slightest miscalculation or illegible footnote could result in a not guilty verdict.

Oh, did I mention that use of a calculator might prematurely set off his world conquering device? Good luck to you, gumshoe.

Chief Harris

THE SUSPECTS

Who is Pemdas Orelse?

NAME	Kaitlin
OCCUPATION	Organic Grocer
FAVORITE NUMBER	51

NAME	Arnold
OCCUPATION	Principal
FAVORITE NUMBER	-555

NAME	Rishi
OCCUPATION	App Developer
FAVORITE NUMBER	3.14

NAME	Dawne
OCCUPATION	Archivist
FAVORITE NUMBER	1492

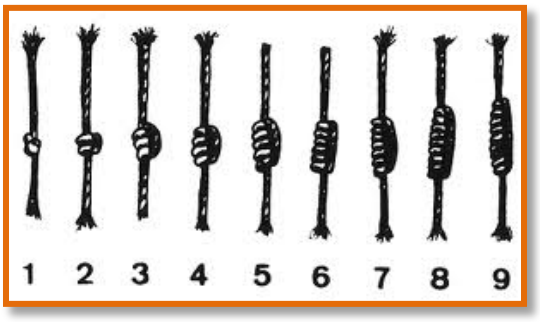
NAME	Nikki
OCCUPATION	Veterinarian
FAVORITE NUMBER	680

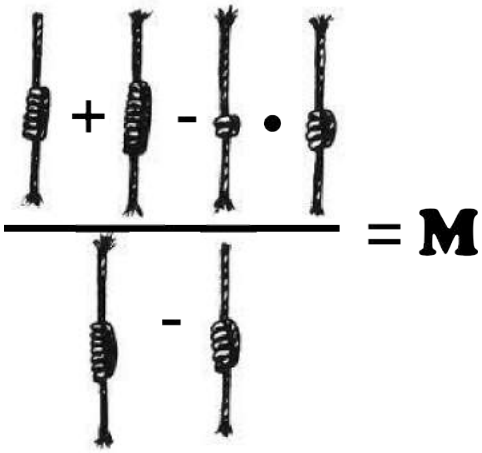
NAME	Ricardo
OCCUPATION	Engineer
FAVORITE NUMBER	11

Scene #1 Museum of Natural History -- Lima, Peru

Pemdas Orelse was caught on a security camera stealing the skeleton of an adult sperm whale. In place of the skeleton, investigators found this note.

Greetings Young Mathematical Cadets! I am the famous Pemdas Orelse and I have decided to boggle your young minds with mathematical puzzles. Hopefully you've learned something because if you can't figure them out, I'll blow up the world or something like that. #muhahaha





In Peru, I've learned about Quipus, which is an ancient method for counting by tying knots of alpaca or llama hair. *If you can figure out this puzzle, you will get your first clue.*

M = ____

Scene #2 Cordoba Golf Club -- Cordoba, Argentina

Posing as a player, Pemdas snuck into the woods of a golf course and uprooted an acacia tree. Investigators are unsure how the acacia tree will be used for the World Conquering Device at this time.

I just watched Angél Cabrera sink an eagle at a wild PGA Tour Latinoamérica event! Let's see if you can figure out who is winning after the first nine holes. *Calculate the player's score relative to par (+/over, -/under).*

PGA TOUR LATINOAMÉRICA

PLAYER	1	2	3	4	5	6	7	8	9	TOTAL
Angél	+1	-2	+4	0	-1	+3	0	-1	-2	
Cristina	-2	-1	+2	+1	0	-1	-1	+2	0	
Ricardo	0	0	-3	+5	-1	0	-2	+1	-1	
Sofia	-1	+5	-1	0	+6	-2	0	-1	-1	

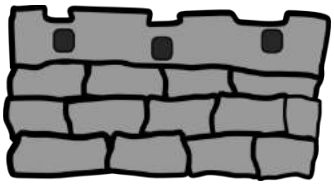
The first letter of the leader's name will be equal to their current score.

_____ = _____

Scene #3 Machu Picchu - Cusco Region of Peru

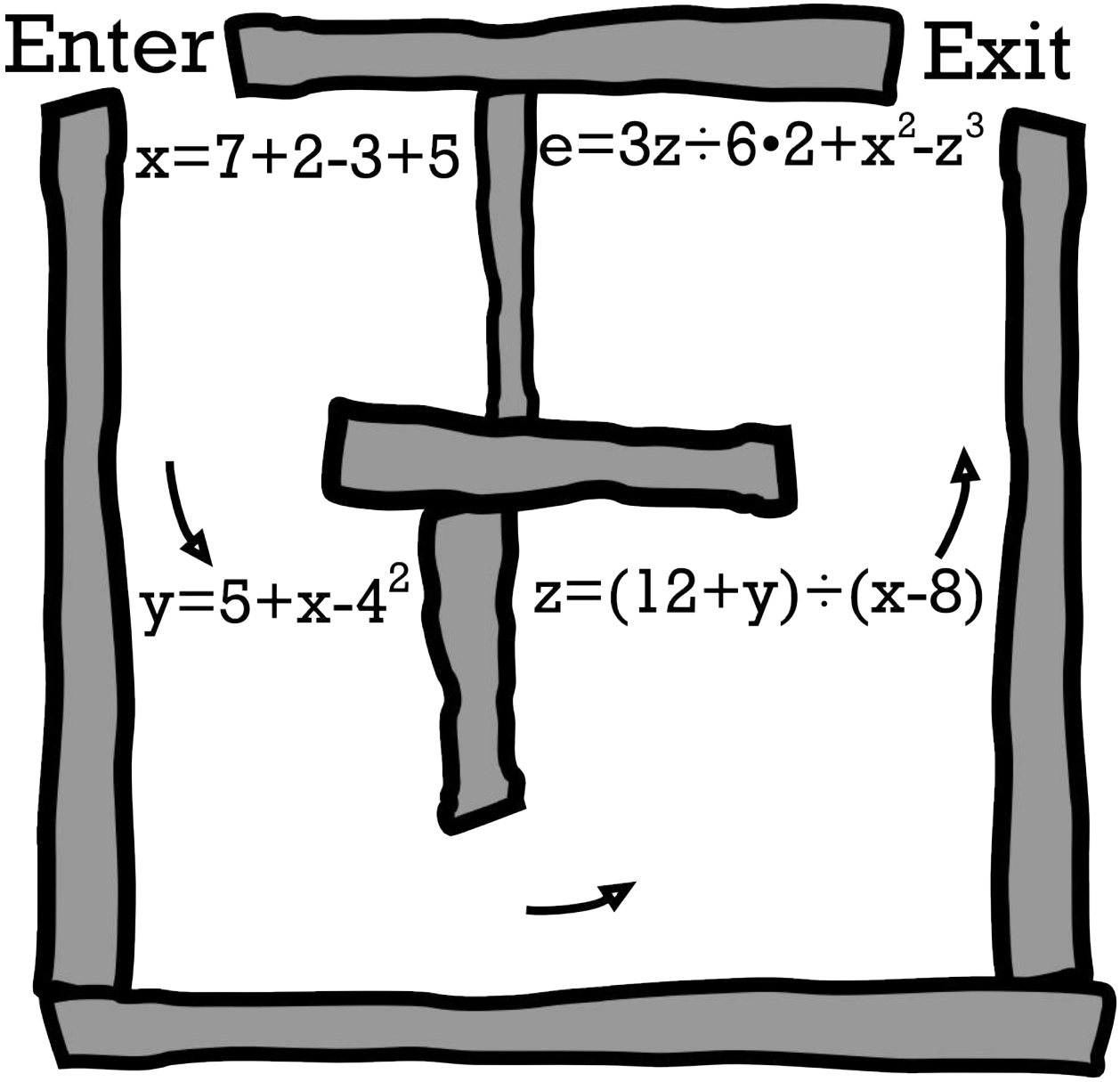
Posing as an ordinary tourist, Pemdas is suspected to be behind the theft of the Intihuatana Stone. This ritual stone of South America is believed by researchers to be a clock or calendar.

How could I go steal things in South America and not visit some ancient ruins? I hope you know your order of operations! #machumanrandypicchu



Work your way around the maze to exit with your next clue...

...if you can...



e = _____

Scene #4 Organic Farm -- Tumianuma, Ecuador

Farmers were stunned to discover that their entire herd of alpacas was shaven. On the largest alpaca, this note was cut into the wool.

At the organic farm, the animals roam free. Animals can move between a Big Yard and a Small Yard where a farmer opens a gate to let them pass. To keep track of how many animals are in the Big Yard, the farmer uses the system below. #combiningLTs

Big Yard Start Count: 65 alpacas, 52 cows and 84 sheep
Activity: +5a, -2c, +9s, -5c, -3a, +7a, -18s, +14a, +31c, +2c, +8s

How many animals are currently in the Big Yard? ***Which animal does the farmer have more of?***

Alpacas _____ Cows _____ Sheep _____

(first letter of the animal with the most) = (# of them in the Big Yard)

_____=_____

Scene #5 Carnival -- Rio de Janeiro, Brazil

Three parade floats were "parade float-jacked" as they began their route. It is suspected that Pemdas was behind these thefts. This note was dropped by a pigeon moments later.

I've found myself in the middle of the largest festival in the world -- #Carnival!

A top secret Samba Drum Line has a unique way of identifying members of their group. *They have to say a verbal expression that is equal to 21* -- the dialing code of Rio de Janeiro.

 *"Seven plus four to the second power minus two."*	 *"The product of negative 5 and negative 4 increased by 3."*
 *"Six less than three raised to the third power."*	 *"The quotient of 105 and the sum of one and four."*

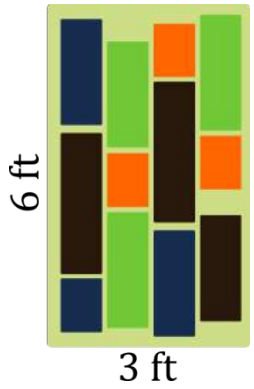
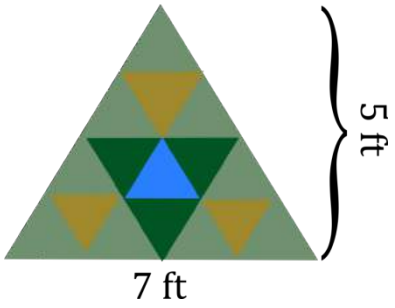
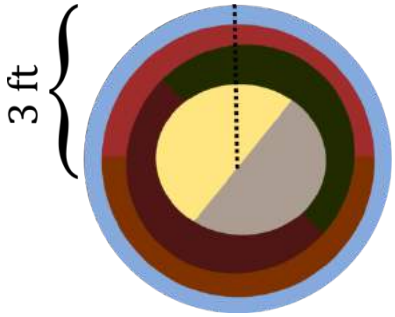
How many of these masked men are ***imposters*** *of the Samba Drum Line?*

Zero	One	Two
⬇	⬇	⬇
a = 0	**c = 1**	**r = 2**

Scene #6 Residential Home -- Bogota, Colombia

Last night, Pemdas Orelse parachuted onto a residential home and snuck inside through the chimney. He escaped with three garbage bags full of fabric and ribbon.

I've enjoyed baffling you with puzzles all across South America. Now it's time to snuggle in front of a nice campfire with my brand new signature Colombian quilt! *I bought the largest one! Which one is mine?* #ilovesuperbigquiltsANDcampfires

		
$A = l \bullet w$	$A = \frac{b \cdot h}{2}$	$A = \frac{22 \cdot r^2}{7}$
Area:	Area:	Area:

Choose the correct clue below the largest quilt

c = 3	**r = 7**	**s = 6**

CRYPTIC PUZZLE SOLVER TEXT MESSAGE

Hahaha. Adios! #worldconqueringdevice

S • A + M − E ÷ R + 1 − C + A

#PemdasOrElse

CSI

Operations & Expressions

Rubric

Skills & Understandings		Exemplary	Proficient	Developing
I can use the order of operations.				
I can perform operations with integers.				
I can translate between verbal and algebraic expressions.				
I can evaluate expressions for given values.				
I can combine like terms.				
Math Processes		**Exemplary**	**Proficient**	**Developing**
Skills & Mechanics	*accurately performs calculations*			
	demonstrates fluency with mathematical skills and processes			
Applications	*accurately interprets word problems and addresses them with appropriate math skills*			
	can articulate the meaning of calculations in the context of the problems.			
Use of Evidence & Analysis	*can determine what evidence is appropriate to answer a question*			
	utilizes mathematical outcomes to support their conclusions			

COMMENTS: